US009725261B2

(12) **United States Patent**
Mizuguchi

(10) **Patent No.: US 9,725,261 B2**
(45) **Date of Patent: Aug. 8, 2017**

(54) **CONVEYANCE UNIT AND IMAGE FORMING APPARATUS INCLUDING THIS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/064,978**

(22) Filed: **Mar. 9, 2016**

(65) **Prior Publication Data**

US 2016/0264367 A1 Sep. 15, 2016

(30) **Foreign Application Priority Data**

Mar. 13, 2015 (JP) 2015-050333

(51) **Int. Cl.**

B65H 1/10 (2006.01)
B65H 1/12 (2006.01)
B65H 1/26 (2006.01)
B65H 3/06 (2006.01)
(Continued)

(52) **U.S. Cl.**

CPC ***B65H 1/12*** (2013.01); ***B65H 1/266*** (2013.01); ***B65H 3/0607*** (2013.01); ***B65H 3/0669*** (2013.01); ***B65H 3/565*** (2013.01); ***G03G 15/6502*** (2013.01); ***G03G 15/6511*** (2013.01); *B65H 2403/512* (2013.01); *B65H 2403/514* (2013.01); *B65H 2403/5332* (2013.01);
(Continued)

(58) **Field of Classification Search**

CPC ... B65H 1/08; B65H 1/12; B65H 1/14; B65H 1/26; B65H 1/266; B65H 2403/51; B65H 2403/512; B65H 2403/514; B65H 2403/5332; B65H 2405/111; B65H 2405/1117; B65H 2405/11171; B65H 3/0607; B65H 3/0669; B65H 3/565; B65H 2601/322

See application file for complete search history.

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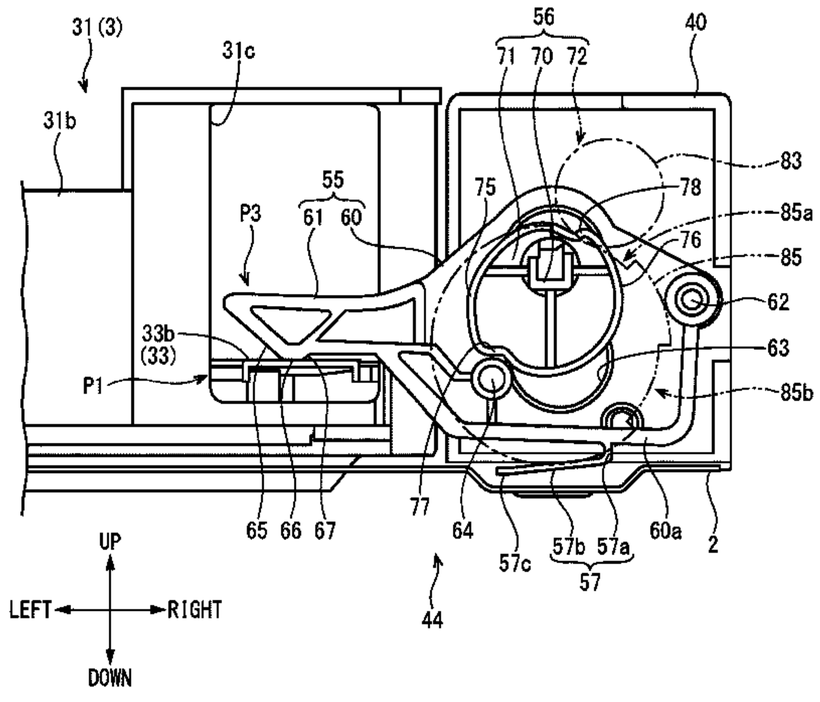
(57) **ABSTRACT**

A conveyance unit includes a cassette removably attached to an apparatus body and a conveyance interlocked part provided in the apparatus body. The cassette includes a sheet storage part for storing a sheet, a lift plate liftably provided between a lowered position and a raised position and a biasing member for biasing the sheet to contact with a pickup roller. The conveyance interlocked part includes a lever for engaging with the lift plate when the cassette is attached to the apparatus body and being liftable together with the lift plate, a pressing mechanism for pressing the lever downward, and a support member provided between the apparatus body and the lever so as to suppress a drop of the lever disengaged from the lift plate when the cassette is detached from the apparatus body.

8 Claims, 11 Drawing Sheets



(51) **Int. Cl.**
B65H 3/56 (2006.01)
G03G 15/00 (2006.01)

(52) **U.S. Cl.**
CPC *B65H 2405/11171* (2013.01); *B65H 2601/322* (2013.01)

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FIG. 1

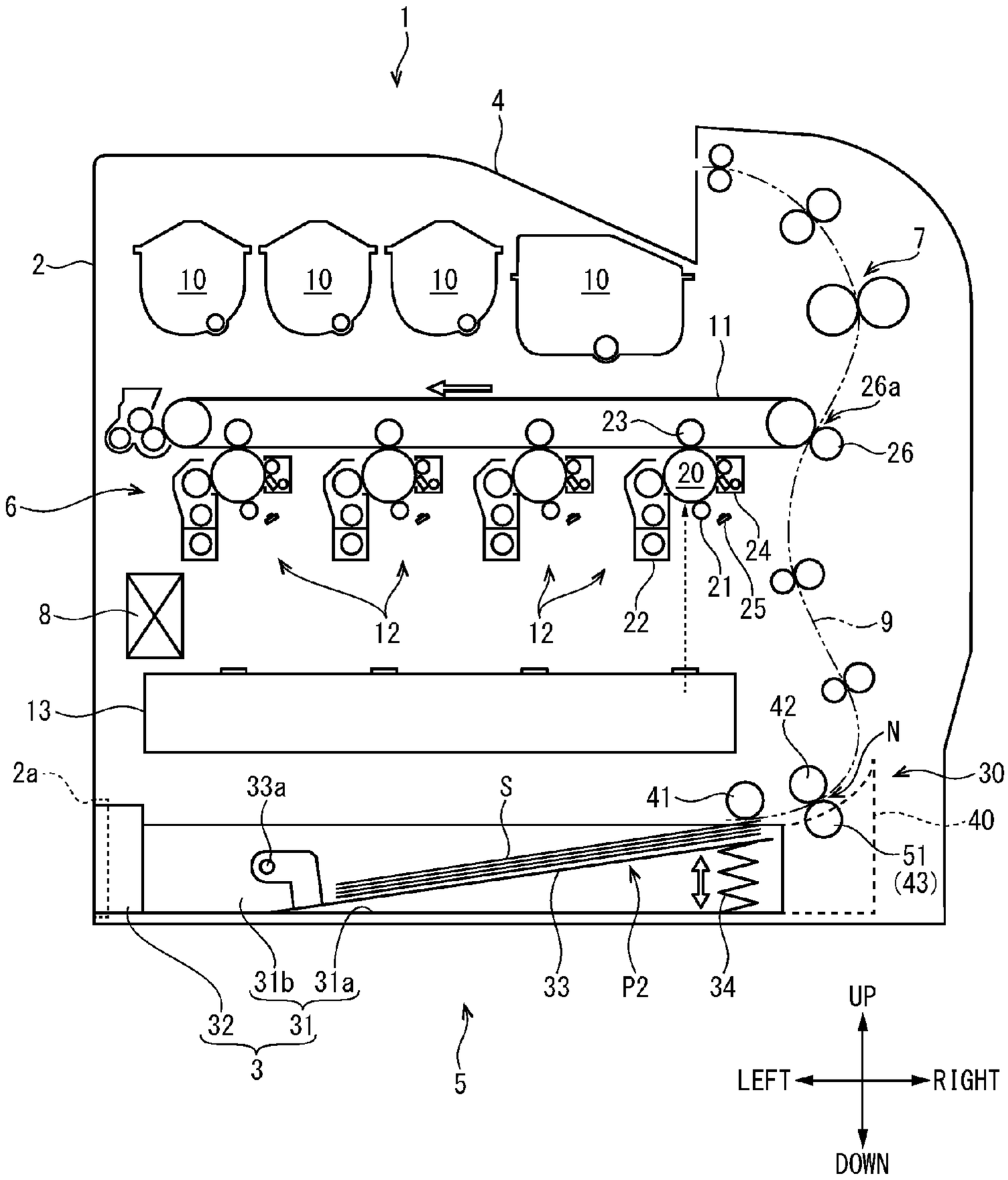

1
4
2
10
10
10
10
7
11
26a
23
26
6
20
24
21
25
22
12
12
9
8
13
42
N
30
2a
33a
S
41
40
51
(43)
31b
31a
32
31
3
33
P2
34
5
UP
LEFT
RIGHT
DOWN

FIG. 2

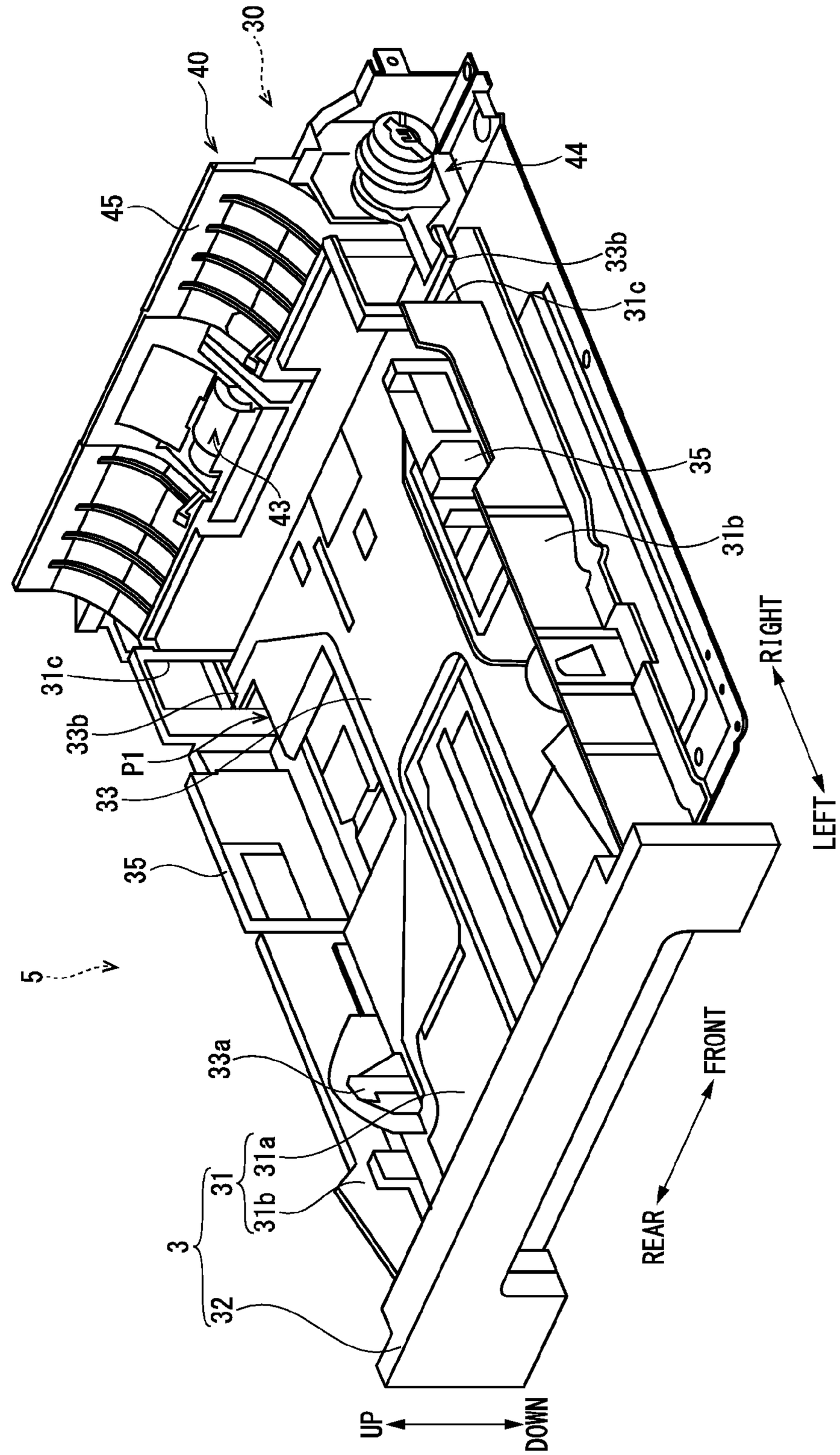

30
40
44
45
33b
31c
43
35
31b
RIGHT
LEFT
31c
33b
P1
33
35
5
33a
FRONT
REAR
31
31a
31b
3
32
UP
DOWN

FIG. 3

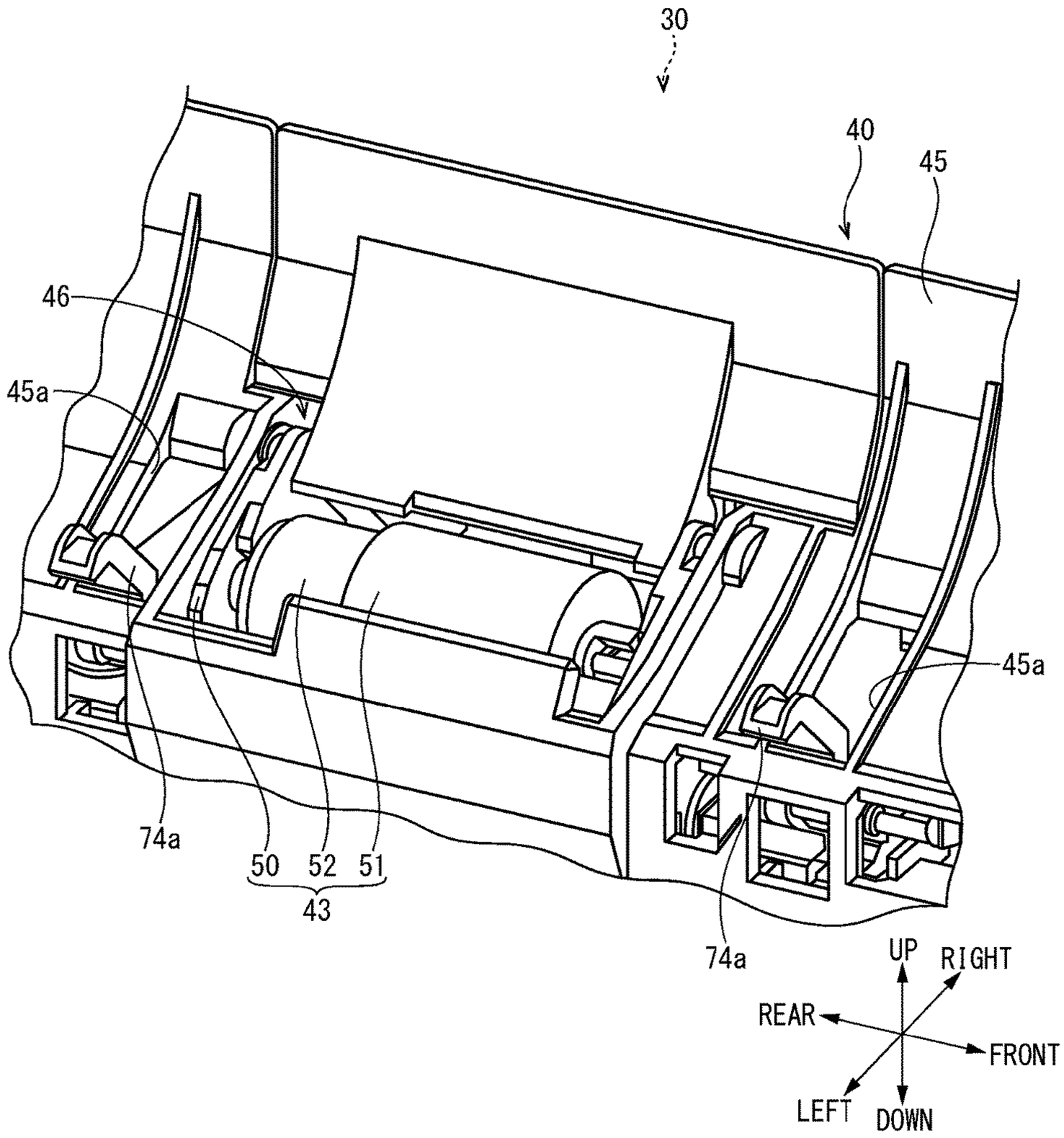

30
40
45
46
45a
45a
74a
50
52
51
43
74a
UP
RIGHT
REAR
FRONT
LEFT
DOWN

FIG. 4

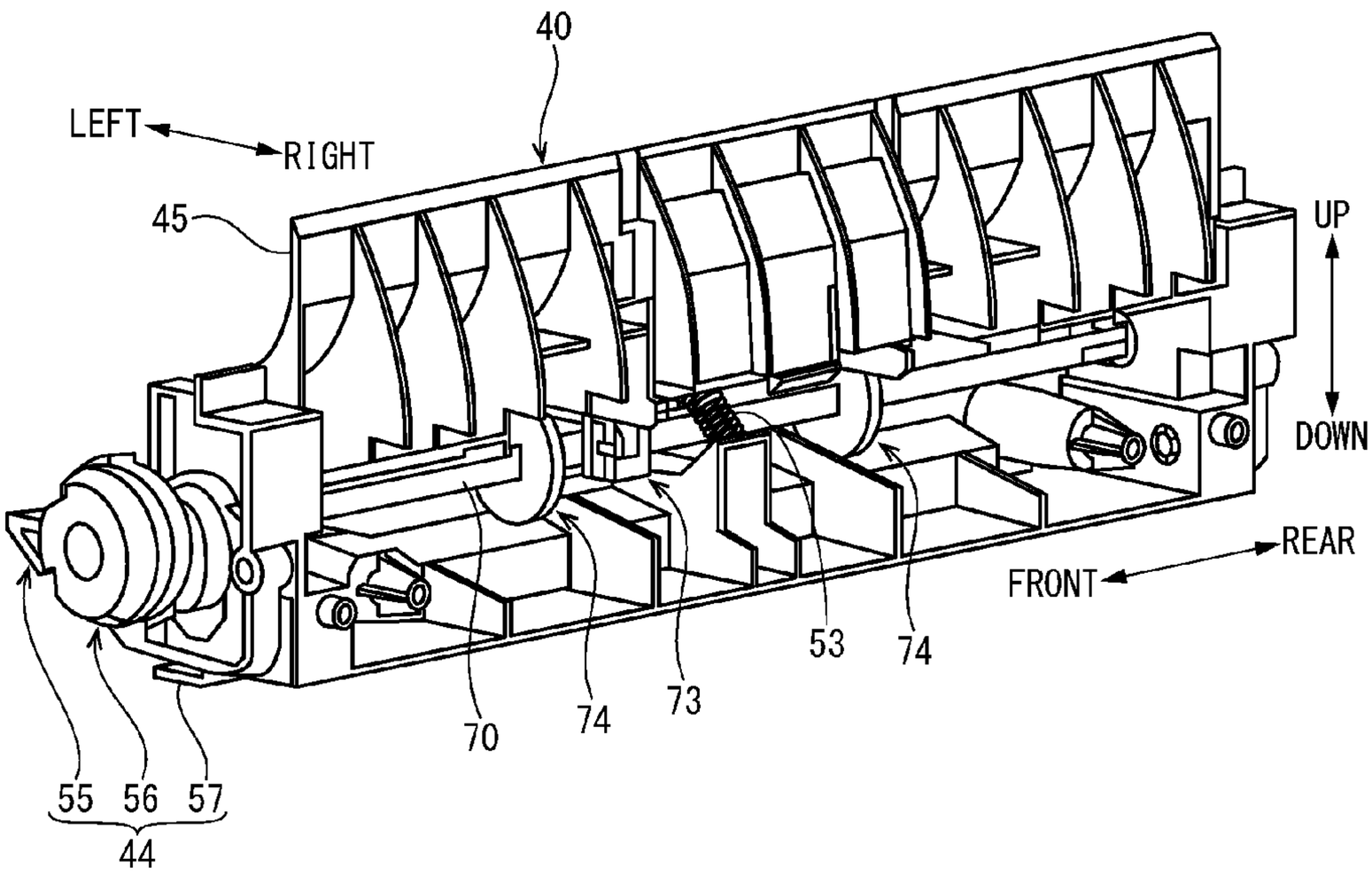


FIG. 5

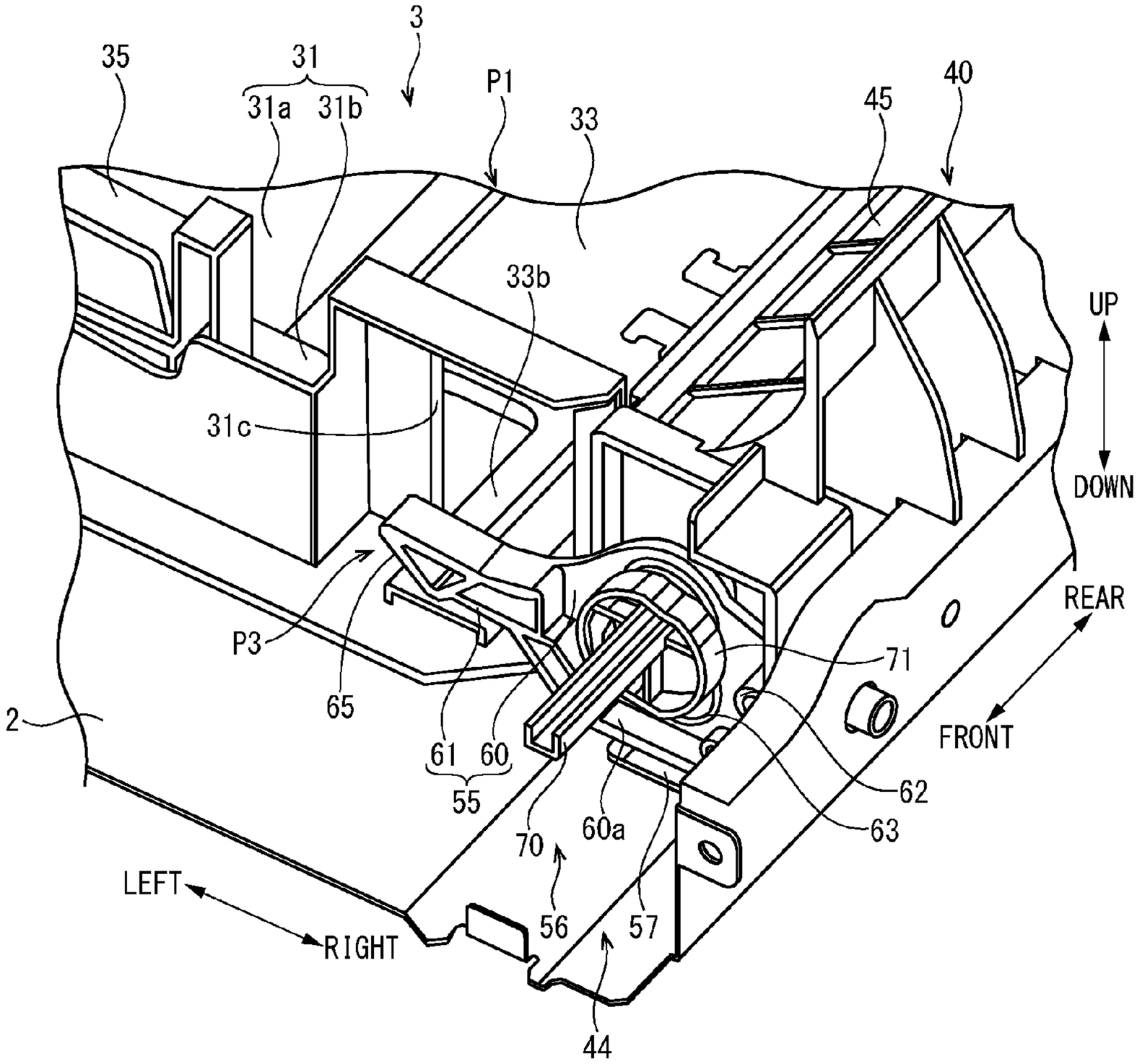

3
35
31
31a
31b
P1
33
45
40
33b
31c
UP
DOWN
REAR
FRONT
P3
65
71
2
61
60
55
62
63
70
60a
LEFT
RIGHT
56
57
44

FIG. 6

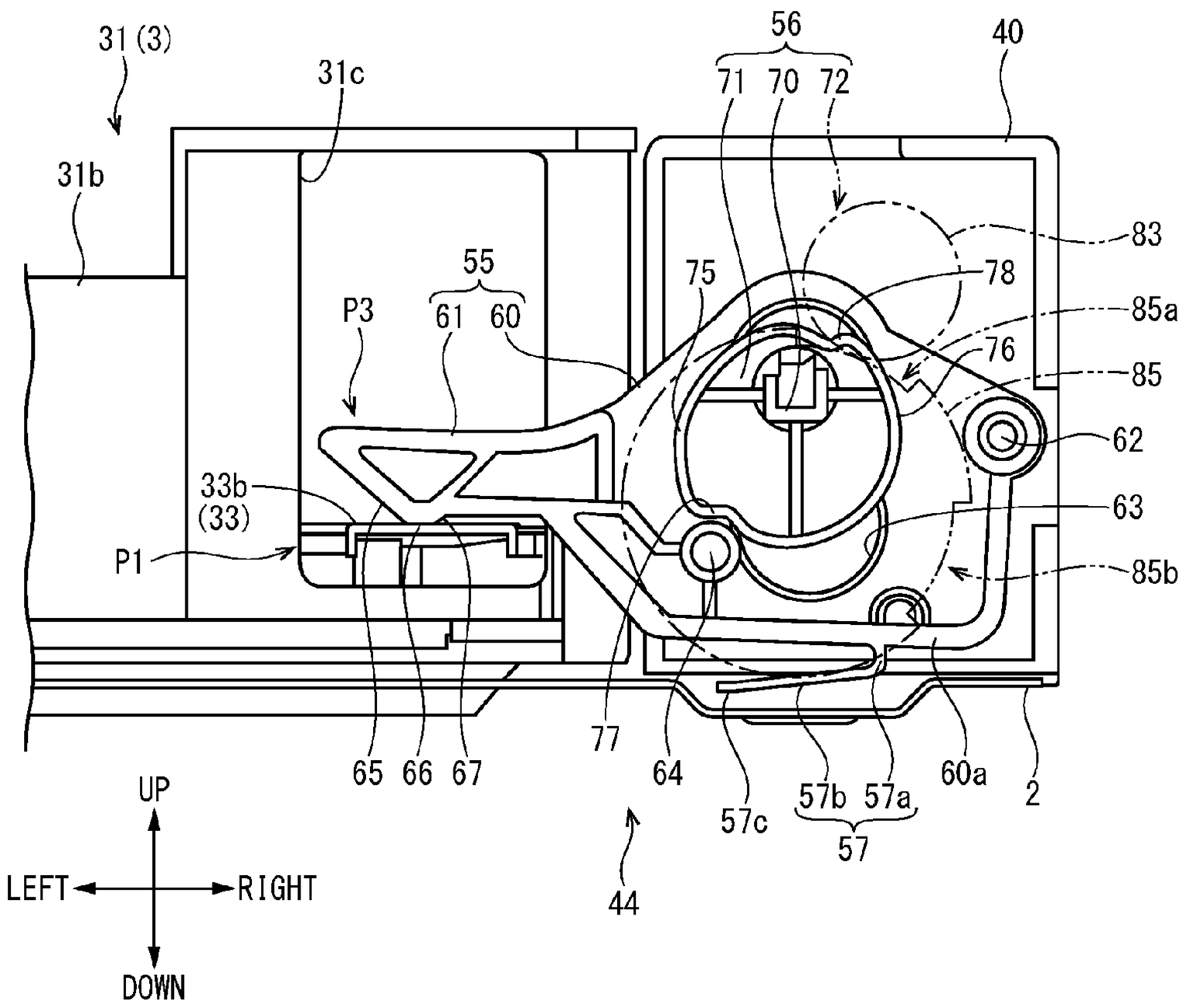

31 (3)
31c
31b
56
71
70
72
40
83
78
85a
76
85
62
63
85b
55
61
60
P3
75
33b
(33)
P1
65
66
67
77
64
57c
57b
57a
57
60a
2
44
UP
LEFT
RIGHT
DOWN

FIG. 7

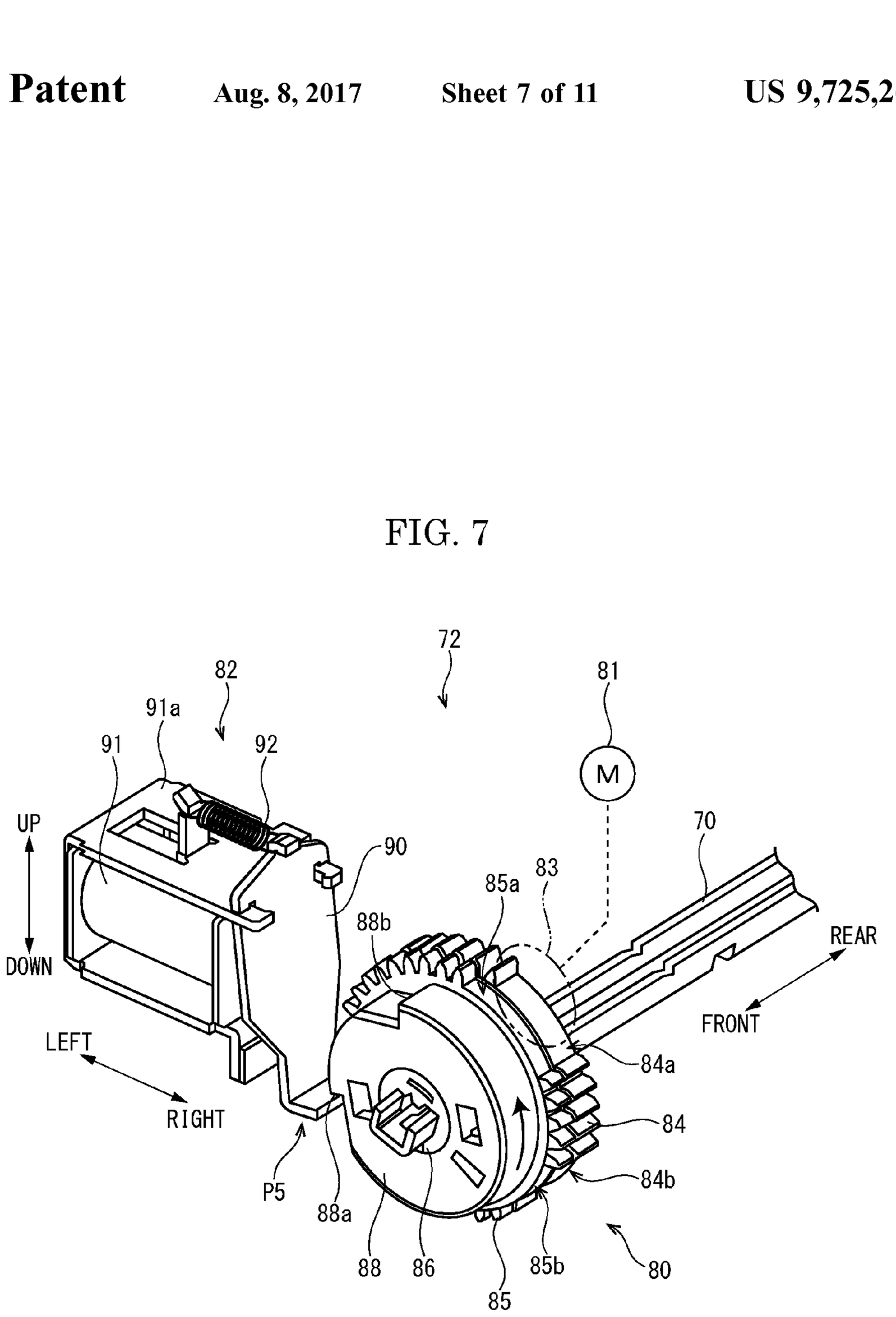

72
82
91a
91
92
81
M
UP
DOWN
90
70
83
85a
88b
REAR
FRONT
LEFT
RIGHT
84a
84
84b
P5
88a
88
86
85
85b
80

FIG. 8

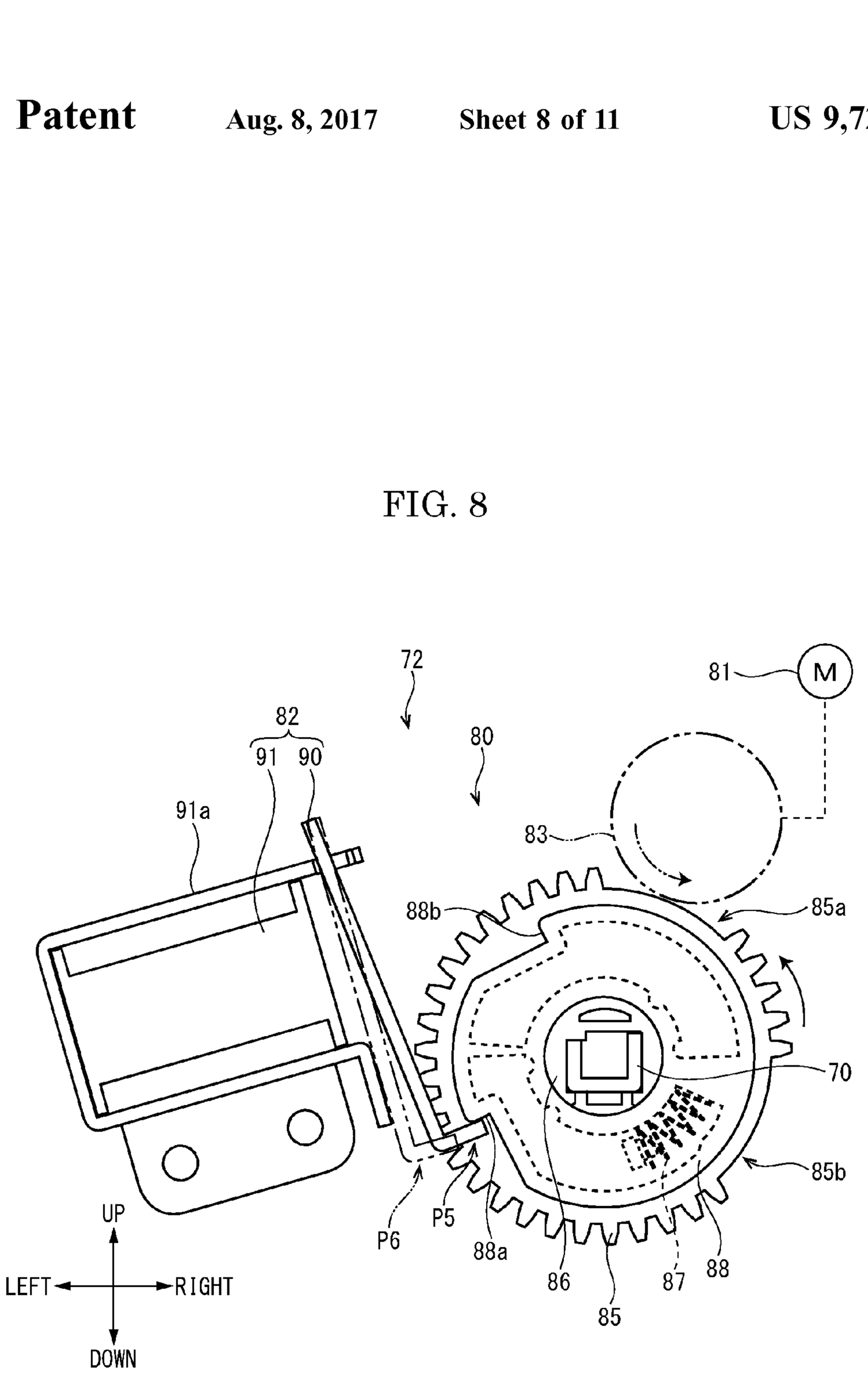

72
81
M
82
91
90
80
91a
83
88b
85a
70
85b
P6
P5
88a
86
85
87
88
UP
LEFT
RIGHT
DOWN

FIG. 9

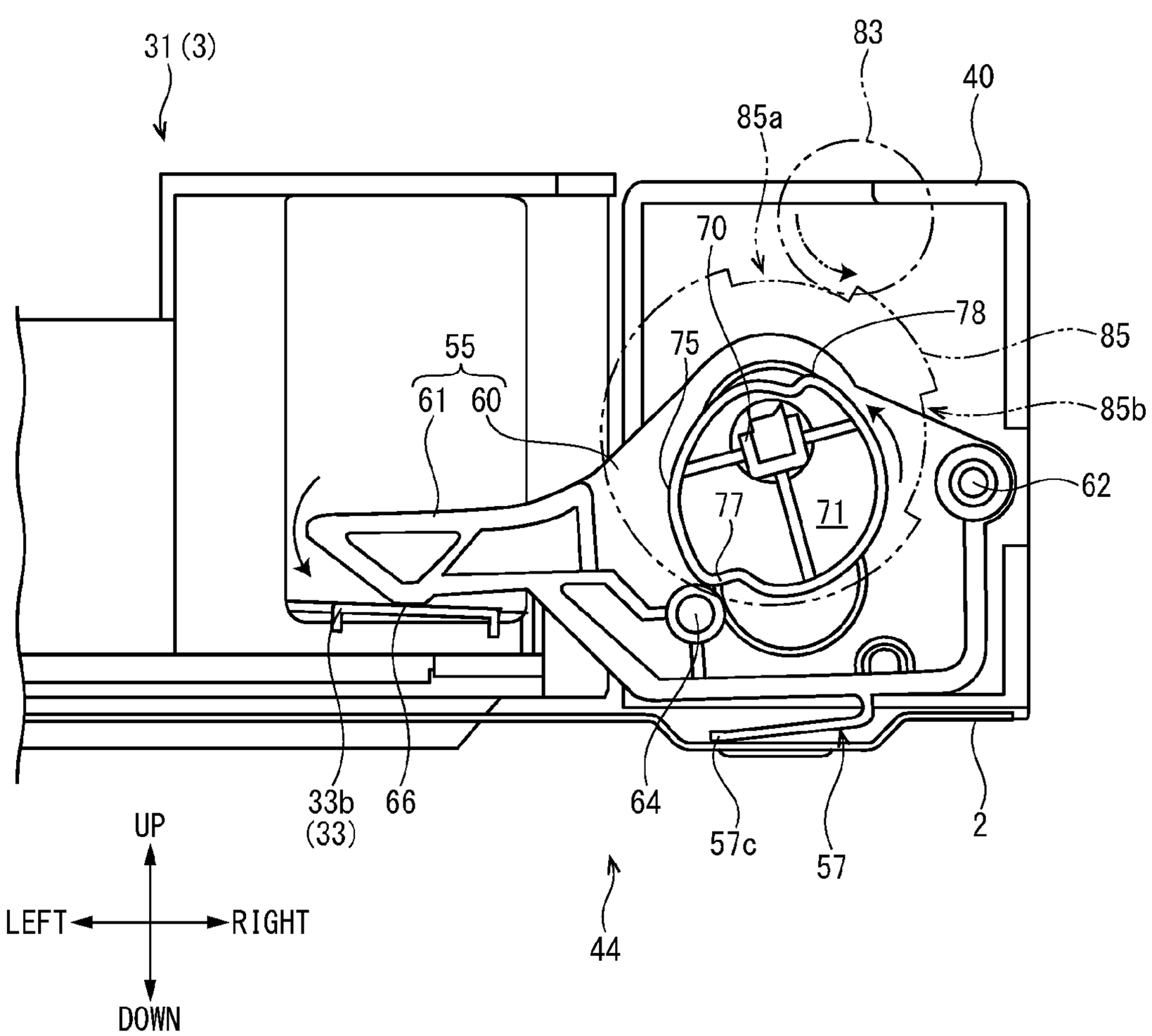

31 (3)
83
40
85a
70
78
85
75
55
61
60
85b
62
77
71
33b
(33)
66
64
57c
57
2
44
UP
LEFT
RIGHT
DOWN

FIG. 10

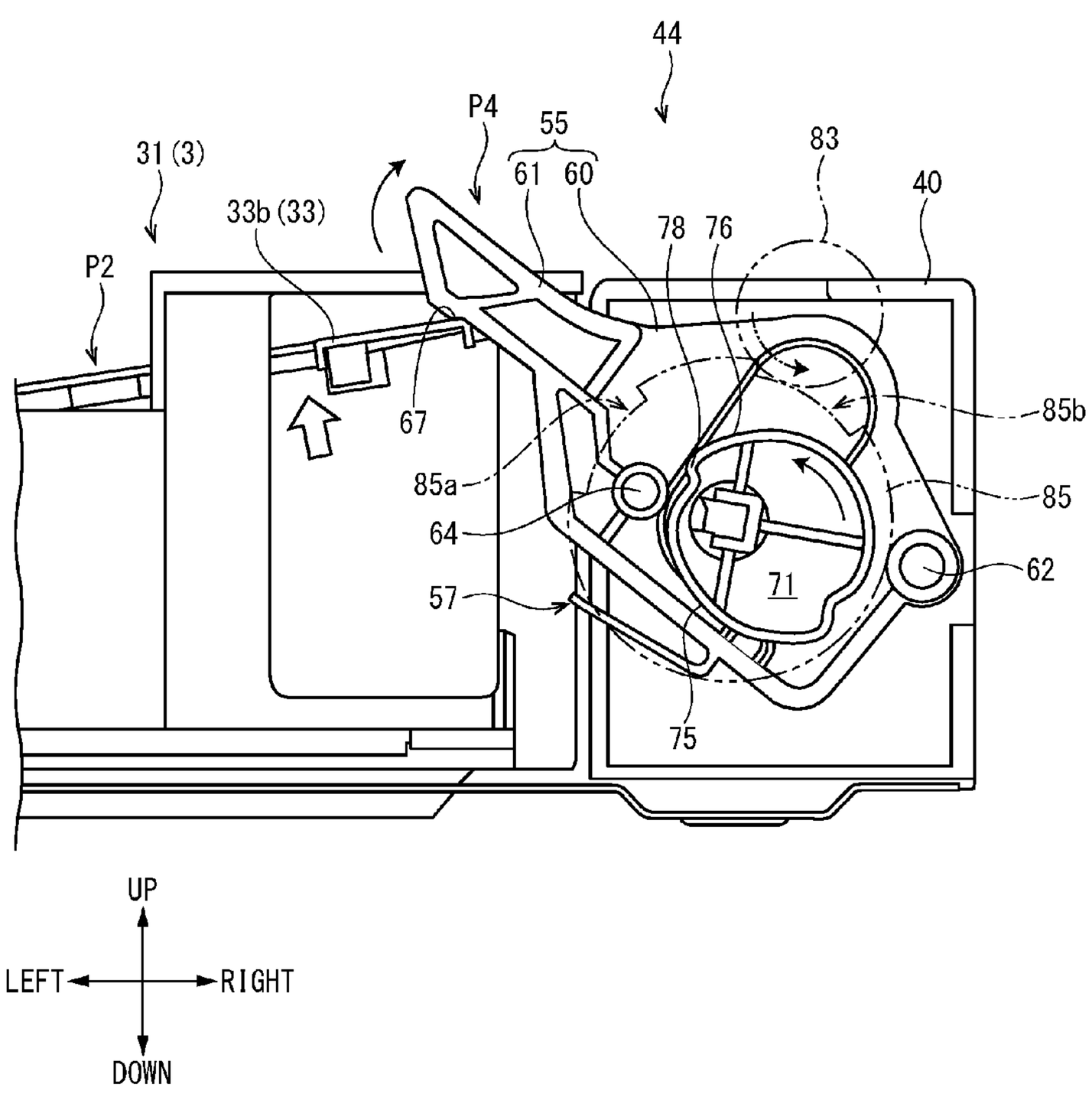
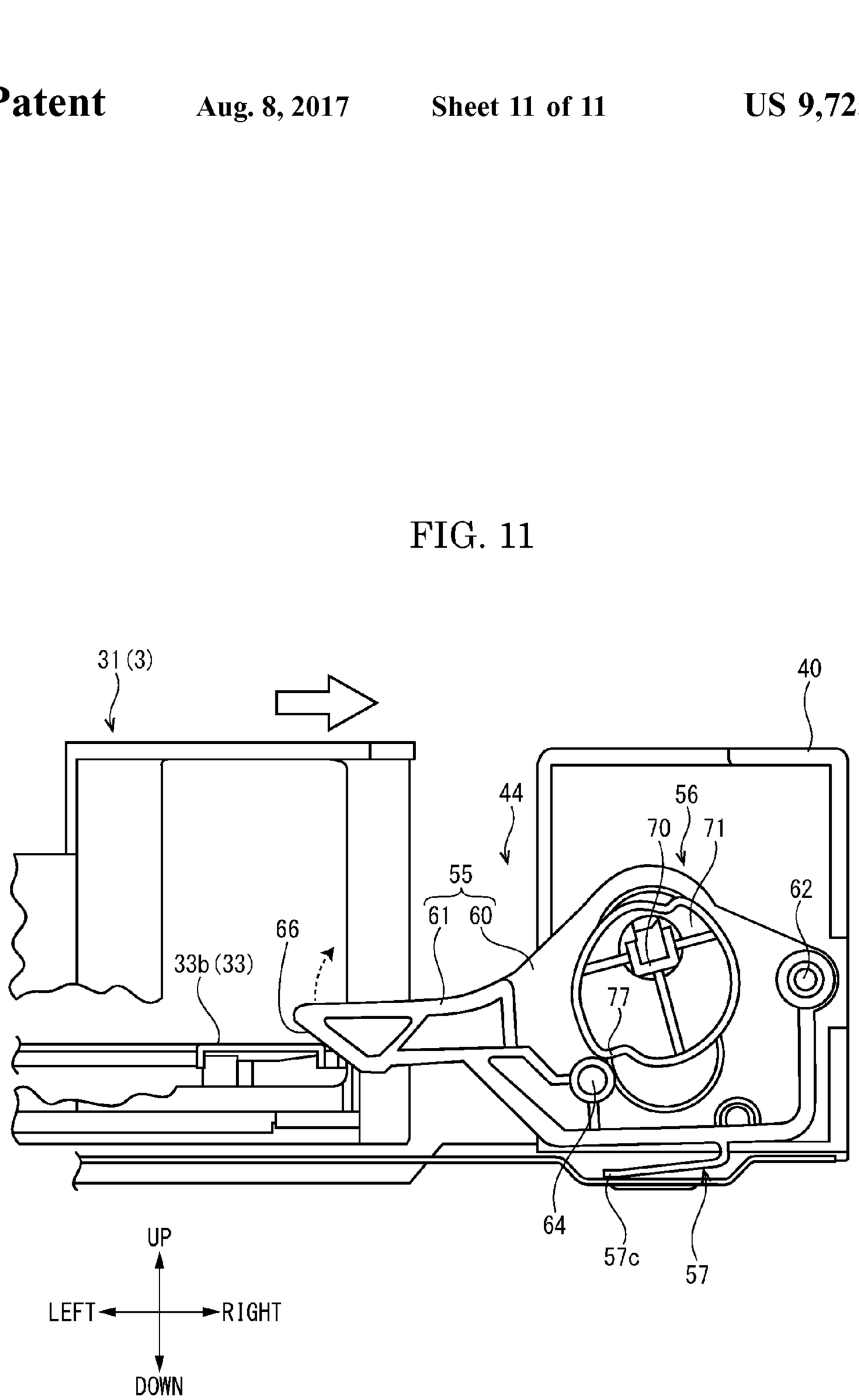

44
P4
55
61
60
83
40
31 (3)
33b (33)
78
76
P2
67
85b
85a
85
64
62
71
57
75
UP
LEFT
RIGHT
DOWN

FIG. 11


31 (3)
40
44
56
70
71
55
61
60
62
66
33b (33)
77
64
57c
57
UP
LEFT
RIGHT
DOWN

CONVEYANCE UNIT AND IMAGE FORMING APPARATUS INCLUDING THIS

INCORPORATION BY REFERENCE

This application is based on and claims the benefit of priority from Japanese Patent application No. 2015-50333 filed on Mar. 13, 2015, the entire contents of which are incorporated herein by reference.

BACKGROUND

The present disclosure relates to a conveyance unit preferably applied in a copying machine or a printer or the like and an image forming apparatus including this.

An image forming apparatus such as a copier and a printer includes a conveyance unit bringing an uppermost sheet of a stacked sheet bundle into pressure contact with a sheet feed roller to convey the sheet.

For instance, a sheet feed unit (a conveyance unit) includes a lift plate provided liftably within a sheet feed cassette, a coil spring for biasing the lift plate upward, and a hook-like eccentric cam for pressing down the lift plate by resisting against a bias force of the coil spring. The eccentric cam is fixed to a shaft and is rotationally driven in one direction. The eccentric cam controls the lift of the lift plate by coming in sliding contact with a cam follower attached to the lift plate. When no sheet is fed, the eccentric cam is located at a reference position and pushes down the lift plate to a vicinity of a lowest point.

However, the conveyance unit described causes the following trouble in attaching the sheet feed cassette. That is, when the sheet feed cassette is drawn out of the apparatus body to replenish sheets for example, the eccentric cam is disengaged from the cam follower and turns in one direction from the reference position. When the sheet feed cassette is attached in this state, the cam follower pushes out the eccentric cam in a cassette attachment direction without engaging with the eccentric cam. Therefore, the eccentric cam of the conveyance unit described above is unable to press down the lift plate. In such a case, it has been required to rotate the eccentric cam once to engage with the cam follower to press down the lift plate. That is, the conveyance unit described above has a problem that it requires to consume a wasteful time and energy of returning the eccentric cam to the reference position.

SUMMARY

In accordance with an embodiment of the present disclosure, a conveyance unit includes a cassette and a conveyance interlocked part. The cassette removably is attached to an apparatus body. The conveyance interlocked part is provided in the apparatus body so as to be adjacent the cassette. The cassette includes a sheet storage part, a lift plate and a biasing member. The sheet storage part stores a sheet. The lift plate liftably is provided between a lowered position along a bottom plate of the sheet storage part and a raised position separated upward from the bottom plate. The biasing member biases the lift plate to the raised position so as to cause the sheet on the lift plate to contact with a pickup roller. The conveyance interlocked part includes a lever, a pressing mechanism and a support member. The lever engages with the lift plate when the cassette is attached to the apparatus body and being liftable together with the lift plate. The pressing mechanism presses the lever downward to keep the lift plate at the lowered position. The support member is provided between the apparatus body and the lever so as to suppress a drop of the lever disengaged from the lift plate when the cassette is detached from the apparatus body.

In accordance with an embodiment of the present disclosure, an image forming apparatus includes a conveyance unit delivering a sheet toward a conveyance path. The conveyance unit includes a cassette and a conveyance interlocked part. The cassette removably is attached to an apparatus body. The conveyance interlocked part is provided in the apparatus body so as to be adjacent the cassette. The cassette includes a sheet storage part, a lift plate and a biasing member. The sheet storage part stores a sheet. The lift plate liftably is provided between a lowered position along a bottom plate of the sheet storage part and a raised position separated upward from the bottom plate. The biasing member biases the lift plate to the raised position so as to cause the sheet on the lift plate to contact with a pickup roller. The conveyance interlocked part includes a lever, a pressing mechanism and a support member. The lever engages with the lift plate when the cassette is attached to the apparatus body and being liftable together with the lift plate. The pressing mechanism presses the lever downward to keep the lift plate at the lowered position. The support member is provided between the apparatus body and the lever so as to suppress a drop of the lever disengaged from the lift plate when the cassette is detached from the apparatus body.

The above and other objects, features, and advantages of the present disclosure will become more apparent from the following description when taken in conjunction with the accompanying drawings in which a preferred embodiment of the present disclosure is shown byway of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view schematically showing an inner structure of a color printer according to one embodiment of the present disclosure.

FIG. **2** is a perspective view illustrating a conveyance unit of one embodiment of the present disclosure.

FIG. **3** is a perspective view illustrating a part of a conveying mechanism part of the conveyance unit of one embodiment of the present disclosure.

FIG. **4** is a perspective view illustrating a conveying mechanism part of the conveyance unit of one embodiment of the present disclosure.

FIG. **5** is a perspective view illustrating a part of the sheet feed cassette and the conveyance interlocked part of the conveyance unit of one embodiment of the present disclosure.

FIG. **6** is a side view illustrating a part of the sheet feed cassette and the conveyance interlocked part of the conveyance unit of one embodiment of the present disclosure.

FIG. **7** is a perspective view illustrating a driving unit of the conveyance unit of one embodiment of the present disclosure.

FIG. **8** is a side view illustrating a driving unit of the conveyance unit of one embodiment of the present disclosure.

FIG. **9** is a side view illustrating a part of the sheet feed cassette and the conveyance interlocked part of the conveyance unit of one embodiment of the present disclosure in a state in which a lever is lowered further from a pressing position.

FIG. **10** is a side view illustrating a part of the sheet feed cassette and the conveyance interlocked part of the conveyance unit of one embodiment in a state in which the lever is lifted to a non-pressed position.

FIG. **11** is a side view illustrating a part of the conveyance interlocked part of the conveyance unit of one embodiment in attaching the sheet feed cassette.

DETAILED DESCRIPTION

In the following, a preferable embodiment of the present disclosure will be described with reference to the appended drawings. It is noted that the following description will be made by setting a near side of each drawing as a front side and based on directions indicated in each drawing. Still further, such terms as 'upstream' and 'downstream' in the following description represent 'upstream', 'downstream' or the like in a conveying direction of a sheet S.

With reference to FIG. **1**, an entire construction of a color printer **1** as an image forming apparatus will be described. FIG. **1** is a sectional view schematically showing an inner structure of the color printer **1**.

The color printer **1** includes an apparatus body **2**, a sheet feed cassette **3** and a sheet discharge tray **4**. The apparatus body **2** is formed substantially into a shape of a box. The sheet feed cassette **3** as a cassette is provided drawably in a lower part of the apparatus body **2**. The sheet discharge tray **4** is provided in a upper part of the apparatus body **2**.

The color printer **1** also includes a conveyance unit **5**, an image forming part **6**, a fixing unit **7**, and a control unit **8** within the apparatus body **2**. The conveyance unit **5** is provided upstream of the sheet feed cassette **3** extended from the sheet feed cassette **3** to the sheet discharge tray **4**. The image forming part **6** is provided at an intermediate part of the conveyance path **9**. The fixing unit **7** is provided downstream of the conveyance path **9**. The control unit **8** integrally controls the color printer **1**.

As described in detail later, the conveyance unit **5** is provided to deliver a sheet S stored in the sheet feed cassette **3** described above toward the conveyance path **9**.

The image forming part **6** includes four tonner containers **10**, an intermediate transfer belt **11**, four drum units **12** and an optical scanning device **13**. The four toner containers **10** are arrayed in parallel in a left-right direction under the sheet discharge tray **4**. The intermediate transfer belt **11** is disposed under the respective toner containers **10**. The four drum units **12** are arrayed in parallel in the left-right direction under the intermediate transfer belt **11**. The optical scanning unit **13** is disposed under the respective drum units **12**.

The four tonner containers **20** house toners (developing agents) of four colors (yellow, magenta, cyan, black). It is noted that the toner may be a single-component developing agent made of a magnetic toner or may be a double-component developing agent including a toner and a carrier. The intermediate transfer belt **11** is driven so as to travel in a direction indicated by a white blanked arrow in FIG. **1**.

The four drum units **12** are provided corresponding to the toners of the respective colors. Each of the drum units **12** includes a photosensitive drum **20**, a charging device **21**, a development device **22**, a primary transferring roller **23**, a cleaning device **24** and a static eliminator **25**. Each drum unit **12** primarily transfers a toner image to the intermediate transfer belt **11**. Disposed on a right side of the intermediate transfer belt **11** is a secondary transfer roller **26** forming a secondary transfer nip part **26***a*. The full-color toner image borne on the intermediate transfer belt **11** is secondarily transferred to a sheet S passing through the secondary transfer nip part **26***a*. The fixing unit **7** fixes the full-color toner image on the sheet S. The sheet S which has undergone the fixing process is then discharged out to the sheet discharge tray **4**.

Next, The conveyance unit **5** will be described in detail below with reference to FIGS. **1** through **8**. FIG. **2** is a perspective view illustrating the conveyance unit **5**. FIG. **3** is a perspective view illustrating a part of a conveying mechanism part **30**. FIG. **4** is a perspective view illustrating a conveying mechanism part **30**. FIG. **5** is a perspective view illustrating a part of the sheet feed cassette **3** and the conveyance interlocked part **44**. FIG. **6** is a side view illustrating a part of the sheet feed cassette **3** and the conveyance interlocked part **44**. FIG. **7** is a perspective view illustrating a driving unit **72**. FIG. **8** is a side view illustrating a driving unit **72**.

As shown in FIGS. **1** and **2**, the conveyance unit **5** includes the sheet feed cassette **3** described above and the conveying mechanism part **30**. The sheet feed cassette **3** stores the sheet S therein. The conveying mechanism part **30** is provided on the right side of the sheet feed cassette **3** attached to the apparatus body **2**. The conveying mechanism part **30** delivers the sheet S within the sheet feed cassette **3** toward the conveyance path **9**.

The sheet feed cassette **3** is configured to be insertable into the apparatus body **2** from an opening **2***a* provided at a lower left surface of the apparatus body **2**. The sheet feed cassette **3** is also configured to be able to be drawn out of the opening part **2***a* in a left direction to replenish the sheet S.

The sheet feed cassette **3** includes a sheet storage part **31** and a designed surface part **32**. The sheet storage part **31** is formed approximately into a shape of a rectangular box stacking and storing the sheet S. The designed surface part **32** is provided at a left end part of the sheet storage part **31**. The designed surface part **32** composes a part of an exterior surface of the apparatus body **2** in the state in which the sheet feed cassette **3** is attached to the apparatus body **2**.

The sheet feed cassette **3** includes within the sheet storage part **31**, a lift plate **33**, a push-up spring **34**, and a pair of front and rear first cursors **35** and a second cursor (not shown).

The lift plate **33** is disposed on the right side of the bottom plate **31***a* (bottom part) of the sheet storage part **31**. A pair of front and rear plate turning shafts **33***a* is provided at a left end part of the lift plate **33**. The pair of front and rear plate turning shafts **33***a* is pivotably supported by a pair of front and rear side plates **31***b*. The lift plate **33** is supported turnably in a vertical direction centering the respective plate turning shafts **33***a*. More specifically, the lift plate **33** is provided liftably between a lowered position P**1** (see FIG. **2**) along the bottom part **31***a* of the sheet storage part **31** and a raised position P**2** (see FIG. **1**) separated upward from the bottom part **31***a*.

As shown in FIG. **2**, a pair of pressure acting parts **33***b* is formed at both front and rear corners on the right side of the lift plate **33**. The pair of pressure acting parts **33***b* extend toward outside from through holes **31***c* opened through the side plates **31***b* of the sheet storage part **31**.

As shown in FIG. **1**, the push-up spring **34**, i.e., a biasing member, is provided between the right side of the lift plate **33** and the bottom plate **31***a*. The push-up spring **34** biases the lift plate **33** toward the raised position P**2**. The push-up spring **34** causes the sheet S stacked on the lift plate **33** to contact with a pickup roller **41**.

As shown in FIG. **2**, the pair of front and rear first cursors **35** is provided on the bottom plate **31***a* so as to face with

each other while interposing the lift plate **33**. The pair of front and rear first cursors **35** is connected respectively with an interlock mechanism (not shown) such as a lack and pinion. The pair of front and rear first cursors **35** slide symmetrically in the front and rear directions by the interlock mechanism and align a front-rear width of the sheet S (or bundle of sheets) stacked on the lift plate **33**. It is noted that the second cursor is provided on the bottom plate **31***a* so as to slide in the right-left direction to align a left-right width of the sheet S (of bundle of sheets).

Next, the conveying mechanism part **30** is provided within the apparatus body **2** as shown in FIGS. **1** and **2**. The conveying mechanism part **30** includes a guide part **40**, the pickup roller **41**, a sheet feed roller **42**, a multiple-feed preventing part **43**, and a conveyance interlocked part **44**. The guide part **40** composes an upstream end part of the conveyance path **9**. The pickup roller **41** is provided above the right end part of the lift plate **33**. The sheet feed roller **42** is provided on the right side of the pickup roller **41**. The multiple-feed preventing part **43** is provided under the sheet feed roller **42** so as to face the sheet feed roller **42**. The conveyance interlocked part **44** is provided in the apparatus body **2** so as to be adjacent the right side of the sheet feed cassette **3**.

As shown in FIGS. **2** through **4**, the guide part **40** is formed approximately into a trapezoidal column lengthy in the front-rear direction. The guide part **40** is formed such that a front-rear width is approximately equal to that of the sheet feed cassette **3**. The guide part **40** is provided with a guide surface **45** formed on an upper surface of the guide part **40** and guiding the sheet S conveyed by the sheet feed roller **42**. The guide surface **45** composes a curved surface of rising gradient from upstream (left side) toward downstream (right side). A storage part **46** is concavely provided at a center part in the front-rear direction of the guide surface **45** (see FIG. **3**).

As shown in FIG. **1**, the pickup roller **41** and the sheet feed roller **42** are formed into a cylindrical shape and are pivotally supported by the apparatus body **2**, respectively. The respective rollers **41** and **42** are rotationally driven by a driving unit (not shown). The pickup roller **41** delivers the sheet S on the lift plate **33** that has moved to the raised position P**2** toward the guide surface **45**. The sheet feed roller **42** conveys the sheet S further toward the downstream.

As shown in FIG. **3**, the multiple-feed preventing part **43** includes a holder **50**, a retard roller **51**, and a torque limiter **52**. The multiple-feed preventing part **43** is configured to prevent the sheet S conveyed by the sheet feed roller **42** from being multiply fed.

The holder **50** is supported swingably within the storage part **46**. The holder **50** is biased upward by a coil spring **53** installed between the holder **50** and the guide part **40** (see FIG. **4**). The retard roller **51** is formed into a cylindrical shape and is supported rotatably on a circumferential surface of the torque limiter **52**. The torque limiter **52** is supported unrotatably by the holder **50**. The torque limiter **52** is configured to be able to rotate more than a torque set in advance in order to control the rotation of the retard roller **51**.

Still further, the retard roller **51** is in pressure contact with the sheet feed roller **42** by being biased by the coil spring **53** and composes a conveying nip N with the sheet feed roller **42** (see FIG. **1**). The retard roller **51** separates an overlapped sheets S by an operation of the torque limiter **52**.

As shown in FIGS. **4** and **5**, the conveyance interlocked part **44** includes a pair of front and rear levers **55**, a pressing mechanism **56**, and a pair of front and rear supporting members **57**. Each lever **55** is configured so as to engage with the lift plate **33** of the sheet feed cassette **3** attached to the apparatus body **2** as described in detail later and so as to be liftable together with the lift plate **33**. The pressing mechanism **56** is configured to press each lever **55** downward to keep the lift plate **33** at the lowered position P**1**. Each support member **57** is provided between the apparatus body **2** and the lever **55**.

As shown in FIGS. **5** and **6**, each of the pair of front and rear levers **55** includes a lever body **60** and an arm part **61**. Each lever **55** is formed in a body by a synthetic resin material for example. It is noted that because the pair of front and rear levers **55** is formed symmetrically with each other, the following description will be made noticing on the front lever **55**.

The lever body **60** is formed approximately into a pentagonal plate in a front view. A flange part **60***a* extending in the front side is formed at a lower end part of the lever body **60**. A lever turning shaft **62** is provided on a right end of the lever body **60**. The lever turning shaft **62** is pivotally supported by a front end surface of the guide part **40**. Accordingly, the lever body **60** is provided so as to operate inter-connectedly with the lift of the lift plate **33** and so as to be able to turn in the vertical direction around the lever turning shaft **62**.

The lever body **60** is provided with a curved hole **63** formed so as to penetrate in the front-rear direction. The curved hole **63** extends in the vertical direction at a center part in the left-right direction of the lever body **60**. The curved hole **63** is curved so as to follow a locus of the turn of the lever body **60**. Provided projectively toward the front side at an edge part of a lower left side of the curved hole **63** is a columnar boss **64**. The boss **64** is provided in the lever body **60** so as to be relatively slidably along cam surfaces **75** and **76** of an eccentric cam **71** described later.

The arm part **61** extends from a front end part of the lever body **60** toward the lift plate **33** side (left side). The arm part **61** is formed approximately into a quadrangular pillar having an equal width with the flange part **60***a*. A front end part (left end part) of the arm part **61** contacts with an upper surface of the pressure acting part **33***b* of the lift plate **33**. The front end part of the arm part **61** is formed approximately in to a triangular column in a front view. More specifically, the arm part **61** is provided with an inclined surface **65** of down gradient from the front end side (left side) to a base end side (right side) formed at a lower side of the front end part thereof.

As shown in FIG. **6**, an abutment surface **66** is formed at a lowermost end of the inclined surface **65**, and an engagement surface **67** is formed on the base end side (right side) of the abutment surface **66**. The abutment surface **66** is formed to be approximately in parallel (horizontal) with an upper surface of the arm part **61** such that the arm part **61** contacts with the lift plate **33** (the pressure acting part **33***b*) located at the lowered position P**1**. The engagement surface **67** is formed such that a front end part (right end part) of the lift plate **33** located at the raised position P**2** engages with the engagement surface **67** (see FIG. **10**).

It is noted that in the following description, a position of the lever **55** where the arm part **61** contacts with the lift plate **33** located at the lowered position P**1** will be called as a pressing position P**3** (see FIG. **6**). Meanwhile, a position of the lever **55** where the arm part **61** contacts with the lift plate **33** located at the raised position P**2** will be called as a non-pressing position P**4** (see FIG. **10**).

As shown in FIGS. **5** and **6**, the pressing mechanism **56** includes a shaft **70** (eccentric shaft), a pair of front and rear eccentric cams **71**, and a driving unit **72**.

The shaft **70** is formed into a shape of a rod having approximately a shape of U in section by a metallic material such as iron. The shaft **70** penetrates through the guide part **40** in the front-rear direction and is supported rotatably by the guide part **40** (see FIG. **4**). Both front and rear end parts of the shaft **70** penetrate through the curved hole **63** of the pair of front and rear levers **55** (the lever body **60**).

As shown in FIG. **4**, the shaft **70** is configured so as to engage with a nip releasing mechanism **73** and a pair of sheet returning mechanisms **74** provided in the guide part **40**. The nip releasing mechanism **73** is provided on the front side of the multiple-feed preventing part **43**. The nip releasing mechanism **73** is configured so as to turn the multiple-feed preventing part **43** downward by operating inter-connectedly with the rotation of the shaft **70**. This arrangement makes it possible to release the conveying nip N. The pair of front and back sheet returning mechanisms **74** is provided both front and rear sides of the multiple-feed preventing part **43** (the storage part **46**). Each sheet returning mechanism **74** includes a hook **74***a* capable of projecting out of a slot **45***a* opened through the guide surface **45** (see FIG. **3**). Each sheet returning mechanism causes the hook **74***a* to jump out of the slot **45***a* inter-connectedly with the rotation of the shaft **70**. This arrangement makes it possible to push back the sheet S left on the guide surface **45** to the upstream side.

As shown in FIG. **6**, the pair of eccentric cams **71** is fixed at both front and rear end parts of the shaft **70**. Each eccentric cam **71** is a so-called disk cam, and is configured such that a distance from a center of rotation of the shaft **70** to its circumference (referred to as an "eccentric radius" hereinafter) is not fixed. It is noted that because the pair of front and rear eccentric cams **71** is formed symmetrically, the following description will be made by noticing on the front eccentric cam **71**.

The first and second cam surfaces **75** and **76** are continuously formed on an outer circumferential surface of the eccentric cam **71**. The first cam surface **75** has the eccentric radius that permits the eccentric cam **71** to come into slidable contact with the boss **64** of the lever body **60** and the lever **55** to turn upward. The second cam surface **76** has the eccentric radius that permits the eccentric cam **71** to come into slidable contact with the boss **64** of the lever body **60** and the lever **55** to turn downward by pressing the boss **64**.

The first and second cam surfaces **75** and **76** are continuously formed on the side where the eccentric radius is large through a lock part **77**. The lock part **77** is concaved from the first cam surface **75** toward the second cam surface **76**. Still further, the first and second cam surfaces **75** and **76** are continuously formed on a side where the eccentric radius is small through a stepped part **78**. The stepped part **78** is concaved from the second cam surface **76** toward the first cam surface **75**. The stepped part **78** is formed such that a difference of step thereof is smaller than that of the lock part **77**.

As shown in FIGS. **7** and **8**, the driving unit **72** includes a transmission mechanism **80**, a driving motor **81**, and a restricting unit **82**. The transmission mechanism **80** is connected with a front end part of the shaft **70**. The driving motor **81**, i.e., a driving source, rotationally drives the transmission mechanism **80**. The restricting unit **82** restricts the rotation of the transmission mechanism **80**. The driving unit **72** is configured to rotate each eccentric cam **71** (the shaft **70**) in one direction.

As shown in FIG. **7**, the transmission mechanism **80** includes an input gear **83**, a first gear **84**, and a second gear **85**. The respective gears **83** through **85** transmit a rotational driving force of the driving motor **81** to the eccentric cam **71**.

The input gear **83** is a so-called spur gear and is rotationally driven by the driving motor **81**. The first gear **84** is a spur gear having two tooth lacking parts **84***a* and **84***b* (parts lacking tooth). The first gear **84** is fixed to the front end part of the shaft **70**. The first gear **84** rotates in a body with the eccentric cam **71**.

The second gear **85** is also a spur gear having two tooth lacking parts **85***a* and **85***b* as shown in FIGS. **7** and **8**. The second gear **85** is rotatably attached to the front end part of the shaft **70** through a cylindrical shaft part **86**. The second gear **85** is disposed so as to be in contact with a front side of the first gear **84**. The second gear **85** is connected with the first gear **84** through a compression spring **87** provided between the first gear **84** and the second gear **85**. A columnar part **88** around which no tooth is formed is projectively provided at a front end surface of the second gear **85**. Provided on a circumferential surface of the columnar part **88** are two receded parts **88***a* and **88***b* separated from each other in a circumferential direction.

The restricting unit **82** includes a hook member **90** and a solenoid mechanism **91**.

The hook member **90** is formed of a metallic plate such as iron approximately into a shape of a letter L in a front view. The hook member **90** is turnably supported by an upper part of a frame **91***a* of the solenoid mechanism **91**. A tensile spring **92** is provided between an upper end of the hook member **90** and an upper surface of the frame **91***a*. The hook member **90** is pulled by the tensile spring **92** such that a lower end part thereof projects toward the second gear **85**. Thereby, the lower end part of the hook member **90** engages with either one of the two receded parts **88***a* and **88***b*. It is noted that in the following description, a position where the hook member **90** engages with the recessed parts **88***a* and **88***b* will be called as an engage position P**5**.

The solenoid mechanism **91** is disposed on a side opposite the second gear **85** while interposing the hook member **90**. By receiving power supply, the solenoid mechanism **91** attracts the hook member **90** while resisting against a bias force of the tensile spring **92**. Thereby, the lower end part of the hook member **90** is detached from the recessed parts **88***a* and **88***b*. It is noted that in the following description, a position where the hook member **90** is detached from the recessed parts **88***a* and **88***b* will be called as a releasing position P**6**.

It is noted that the driving motor **81**, the restricting unit **82**, and others are connected with a power source (not shown) to receive the electric power supply. The control unit **8** controls the power source and others to control the drives of the driving motor **81**, the restricting unit **82**, and others.

As shown in FIG. **6**, the pair of front and rear supporting members **57** are integrally formed with the lever **55** by a synthetic resin material for example. It is noted that because the pair of front and rear supporting members **57** is formed symmetrically, the following description will be made by noticing on the front side supporting member **57**. It is noted that the following description will be made based on the lever **55** located at the pressing position P**3**.

The support member **57** extends from a lower surface of the lever body **60** so as to bend to the lift plate **33** side (left side) and is formed approximately into a shape of letter L. More specifically, the support member **57** includes a base part **57***a* and an extension part **57***b*. The base part **57***a* slightly extends downward from the lower surface of the

lever body **60**. The extension part **57***b* extends in the left direction from a lower part of the base part **57***a*. The extension part **57***b* inclines toward the left side from the base part **57***a* side so as to be distant from the lower surface of the lever body **60**. Formed at a free end (left end part) of the extension part **57***b* is an abutment part **57***c* approximately in parallel with the lower surface of the lever body **60**.

The support member **57** is formed to be elastically deformable in the lift direction of the lever **55** (vertical direction). More specifically, the extension part **57***b* elastically deforms so as to turn in the vertical direction centering on a part connected with the base part **57***a*.

Next, operations of the conveyance unit **5** will be described with reference to FIGS. **6**, **8** through **10**. FIG. **9** is a side view illustrating a part of the conveyance interlocked part **44** or the like in a state in which a lever **55** is lowered further from a pressing position P**3**. FIG. **10** is a side view illustrating a part of the conveyance interlocked part **44** or the like in a state in which the lever **55** is lifted to a non-pressed position P**4**. It is noted that the following description will be made by assuming a state in which the sheet feed cassette **3** is attached into the apparatus body **2**. It is noted that the description will be made by continuously noticing on the front lever **55**, the support member **57**, and the eccentric cam **71**.

When no sheet S is supplied (fed), the eccentric cam **71** is located at a position where the boss **64** of the lever **55** fits into the lock part **77** (referred to as a 'reference position' hereinafter) and the lever **55** is kept at the pressing position P**3** as shown in FIG. **6**. The lever **55** displaced to the pressing position P**3** by the eccentric cam **71** presses the lift plate **33** from above by resisting against a bias force of the push-up spring **34**. Thereby, the lift plate **33** is kept at the lowered position P**1**. It is noted that the boss **64** of the lever **55** is kept in the state of fitting with the lock part **77** of the eccentric cam **71** by receiving the bias force of the push-up spring **34** through the lift plate **33**.

In the state described above, the input gear **83** faces the tooth lacking part **85***a* downstream in a rotation direction of the second gear **85**. The compression spring **87** is compressed between the first and second gears **84** and **85**. The hook member **90** of the restricting unit **82** is moved to the engaging position P**5** and is engaged with the recessed part **88***a* downstream in the rotation direction of the second gear **85** (see a solid line in FIG. **8**). That is, the rotation of the second gear **85** (the transmission mechanism **80**) is restricted. The support member **57** is located at a position not in contact with the bottom surface of the apparatus body **2**.

Next, in a case of supplying (feeding) the sheet S, the control unit **8** drives and controls the solenoid mechanism **91** of the restricting unit **82** to move the hook member **90** to the releasing position P**6** (see a two-dot chain line in FIG. **8**). The control unit **8** also drives and controls the driving motor **81** to rotate the input gear **83**. In response to the move of the hook member **90** to the releasing position P**6**, only the second gear **85** rotates counterclockwise by a restoration force (bias force) of the compression spring **87** being compressed as shown in FIG. **6** and others. The second gear **85** rotated by the compression spring **87** engages with the input gear **83** rotationally driven (see FIG. **9**). The second gear **85** that has engaged with the input gear **83** rotates while compressing the compression spring **87**. In response to an advance of the rotation of the second gear **85**, the first gear **84** is integrated with the second gear **85** through the compression spring **87** and starts to rotate. Thereby, the shaft **70** and the eccentric cam **71** also start to rotate counterclockwise as shown in FIG. **9** and others.

In response to the advance of the rotation of the eccentric cam **71**, relatively the boss **64** of the lever **55** rides over the lock part **77** and moves toward the first cam surface **75** as shown in FIG. **9**. At this time, the part where the lock part **77** is connected with the first cam surface **75** pushes the boss **64** of the lever **55** downward. Accordingly, the lever **55** turns downward, and the abutment part **57***c* of the support member **57** contacts with the bottom surface of the apparatus body **2**. The lever **55** turns downward while elastically deforming the support member **57** (the extension part **57***b*). It is noted that at this time, the lever **55** pushes down the lift plate **33** further from the lowered position P**1** by resisting against the bias force of the push-up spring **34**.

As described above, each support member **57** elastically deforms by causing the L-shaped free end (the support member **57**) to contact with the bottom surface of the apparatus body **2**. Because the free end part of each support member **57** extends to the lift plate **33** side (left side), each support member **57** can smoothly deflect while assuring an adequate displacement.

When the boss **64** is disengaged from the lock part **77** and starts to be in slidable contact with the first cam surface **75**, the lever **55** turns upward by a restoration force of the support member **57** and the bias force of the push-up spring **34**. It is noted that the lift plate **33** also returns to the lowered position P**1** by the bias force of the push-up spring **34**.

As described above, the first cam surface **75** has the eccentric radius that permits the lever **55** to rise. Therefore, in response to the further advance of the rotation of the eccentric cam **71**, the lift plate **33** rises from the lowered position P**1** toward the raised position P**2** by being biased by the push-up spring **34**. The lever **55** rises from the pressing position P**3** toward the non-pressing position P**4** in linkage with the rise of the lift plate **33**. Still further, the boss **64** of the lever **55** relatively moves to a position just before the stepped part **78** along the first cam surface **75**.

When the boss **64** moves to the position just before the stepped part **78**, the control unit **8** controls the solenoid mechanism **91** of the restricting unit **82** to move the hook member **90** to the engaging position P**5**. Thereby, the hook member **90** engages with the recessed part **88***b* upstream in the rotation direction of the second gear **85** (not shown). In this state, the second gear **85** rotates to the position where the tooth lacking part **85***b* upstream in the rotation direction faces the input gear **83**. Accordingly, the driving force to be inputted from the input gear **83** to the second gear **85** is interrupted. It is noted that at this time, the control unit **8** may control the driving motor **81** to stop driving.

It is noted that during the process in which the lever **55** turns from the pressing position P**3** to the non-pressing position P**4**, a rotation of the shaft **70** is transmitted to the nip releasing mechanism **73** (see FIG. **4**). The nip releasing mechanism **73** turns the multiple feed preventing part **43** upward and brings the retard roller **51** into pressure contact with the sheet feed roller **42**. Thereby, the conveying nip N is formed. It is noted in the case of supplying the sheet S, each return hock **74***a* faces under the guide surface **45**.

By being pushed up to the raised position P**2**, the lift plate **33** presses the sheet S (of a bundle) stacked thereon against the pickup roller **41** (see FIG. **1**). The pickup roller **41** comes into contact with the uppermost sheet S and delivers the sheet S toward the conveying nip N.

Here, in a case when one sheet S is sent to the conveying nip N, the retard roller **51** receives a large torque (a torque exceeding a restrictable range of the torque limiter **52**) from the sheet feed roller **42** while interposing the sheet S and is driven. Thereby, the sheet S is conveyed along the guide

surface **45** and is sent to the conveying path **9**. Meanwhile, in a case when two sheets S are sent to the conveying nip N, the torque transmitted from the sheet feed roller **42** to the retard roller **51** is weakened. Due to that, the torque limiter **52** becomes operative, and the retard roller **51** does not rotate. As a result, the retard roller **51** gives a frictional force to a sheet S other than the sheet Sin direct contact with the sheet feed roller **42**. Thereby, the sheet feed roller **42** sends only the sheet S in direction contact with the sheet feed roller **42** to the conveying path **9**.

After finishing supplying the sheet S, the control unit **8** makes a control of returning the eccentric cam **71** to the reference position. At first, the control unit **8** drives and controls the solenoid mechanism **91** to move the hook member **90** to the releasing position P**6** and drives and controls the driving motor **81** to rotate the input gear **83**. In response to the move of the hook member **90** to the releasing position P**6**, only the second gear **85** rotates counterclockwise and engages with the input gear **83** as shown in FIG. **10** and others by the restoration force of the compression spring **87** being compressed. The second gear **85** that has engaged with the input gear **83** rotates while compressing the compression spring **87**. Soon after that, the first gear **84** is integrated with the second gear **85** through the compression spring **87** and starts to rotate. Thereby, the shaft and the eccentric cam **71** also start to rotate counterclockwise as shown in FIG. **10** and others.

The rotation of the shaft **70** is transmitted to the nip releasing mechanism **73** (see FIG. **4**). The nip releasing mechanism **73** turns the multiple feed preventing part **43** downward and releases the conveying nip N.

In response to the advance of the rotation of the eccentric cam **71**, the boss **64** of the lever **55** comes relatively into contact with the stepped part **78** and moves toward the second cam surface **76**. Because the second cam surface **76** has the eccentric radius that pushes down the boss **64**, the lever **55** turns downward and presses the lift plate **33** down by resisting against the bias force of the push-up spring **34**. Thereby, the sheet S on the lift plate **33** is separated downward from the pickup roller **41**.

It is noted in the process in which the lever **55** is lowered, the rotation of the shaft **70** is transmitted to each returning mechanism **74**. Thereby, each returning hook **74***a* jumps out of the slot **45***a* of the guide surface **45** in linkage with the drop of the lever **55** and returns the sheet S on the guide surface **45** to the sheet storage part **31** side (on the lift plate **33**).

In response to the further advance of the rotation of the eccentric cam **71**, the lever **55** moves from the non-pressing position P**4** to the pressing position P**3** and the lift plate **33** moves from the raised position P**2** to the lowered position P**1** as shown in FIG. **6**. In this state, the boss **64** of the lever **55** is locked by the lock part **77** of the eccentric cam **71**. That is, the eccentric cam **71** returns to the reference position and keeps the lever **55** at the pressing position P**3** (the lift plate **33** is kept at the lowered position P**1**). It is noted that when the eccentric cam **71** moves to the reference position, the control unit **8** controls the solenoid mechanism **91** to move the hook member **90** to the engaging position P**5** and controls the driving motor **81** to stop driving.

As described above, when the eccentric cam **71** rotates and the boss **64** is locked by the lock part **77**, the lever **55** keeps the lift plate **33** at the lowered position P**1**. Meanwhile, when the eccentric cam **71** rotates and the boss **64** is unlocked from the lock part **77**, the lever **55** is lowered within the range in which the support member **57** is elastically deformable and becomes liftable together with the lift plate **33**.

According to the conveyance unit **5** of the present embodiment described above, when the eccentric cam **71** rotates from the condition in which the boss **64** is locked by the lock part **77**, the lock part **77** rides over the boss **64** and the lever **55** is slightly lowered. At this time, the support member **57** permits the eccentric cam **71** to rotate while suppressing a postural change of the lever **55** by the elastic deformation. This arrangement makes it possible to link the lift of the lift plate **33** with the rotation of the eccentric cam **71**.

Still further, according to the conveyance unit **5** of the present embodiment, the transmission mechanism **80** and the restricting unit **82** control the rotation of the eccentric cam **71** through the respective gears **84** and **85** by cooperating with each other. This arrangement makes it possible to control the rotation of the eccentric cam **71** corresponding to a status of conveyance of the sheet S.

Next, an operation of the conveyance interlocked part **44** in the case when the sheet feed cassette **3** is drawn out of the apparatus body **2** will be described with reference to FIG. **11**. FIG. **11** is a side view illustrating a part of the conveyance interlocked part **44** when the sheet feed cassette **3** is to be attached.

By the way, when there is no sheet S or there is only few sheets S on the lift plate **33**, the lift plate **33** is biased by the push-up spring **34** and is displaced to the raised position P**2** (see FIG. **10**). The sheet feed cassette **3** is drawn out of the apparatus body **2** (the opening part **2***a*) in this state to replenish sheets S. When the sheet feed cassette **3** is detached from the apparatus body **2**, while each lever **55** turns downward, its turn is restricted because each support member **57** comes into contact with the bottom surface of the apparatus body **2** (see FIG. **11**).

Meanwhile, in a case when the sheets S are fully stacked or a large number of sheets are stacked on the lift plate **33**, the lift plate **33** is displaced to the lowered position P**1** by weight of the sheets S. The sheet feed cassette **3** may be able to be drawn out of the apparatus body **2** (the opening part **2***a*) also in this state. The lift plate **33** is pressed downward by the pressing mechanism **56** (the eccentric cam **71**) through each lever **55** as described above. When the sheet feed cassette **3** is detached out of the apparatus body **2** in this state, each lever **55** separates relatively from the lift plate **33** and is pressed downward by the pressing mechanism **56**. At this time, although each lever **55** tries to turn downward, each support member **57** suppresses each lever **55** from being lowered (see FIG. **11**). That is, each support member **57** keeps the posture of each lever **55** approximately to the same posture of the lever **55** before the sheet feed cassette **3** has been detached.

Here, the sheet feed cassette **3** is provided with a lock mechanism not shown to lock the lift plate **33** at the lowered position P**1** when the sheet feed cassette **3** is drawn out. When the sheet feed cassette **3** is attached to the apparatus body **2**, the lift plate **33** is kept (locked) at the lowered position P**1** by the operation of the lock mechanism. The lock mechanism is configured to release the lock of the lift plate **33** in the process of attaching the sheet feed cassette **3** into the apparatus body **2** (just before completing the attachment).

Although not shown, if there is no support member **57**, each lever **55** turns downward and the arm part **61** inclines in a lower left direction. If the sheet feed cassette **3** is caused to enter within the apparatus body **2** in this state, there is a

possibility that the pressure acting part **33***b* of the lift plate **33** collides against the arm part **61** of the lever **55**. In such a case, there is a possibility that not only the cassette **3** cannot be smoothly attached into the apparatus body **2**, but also of breaking the lift plate **33**, the lever **55** and others.

In this regard, according to the conveyance unit **5** of the present embodiment, each support member **57** operates so as to suppress the drop of each lever **55** disengaged from the lift plate **33** when the sheet feed cassette **3** is detached from the apparatus body **2**. That is, regardless whether or not there is the sheet feed cassette **3**, the posture of each lever **55** is kept approximately constant. Du to that, each lever **55** will not become an obstacle in moving the lift plate **33** (the pressure acting part **33***b*) in the process of attaching the sheet feed cassette **3** into the apparatus body **2**. This arrangement makes it possible to smoothly attach the sheet feed cassette **3** into the apparatus body **2** such that each lever **55** engages adequately with the lift plate **33** (the pressure acting part **33***b*).

Still further, according to the conveyance unit **5** of the present embodiment, the inclined surface **65** is formed at the lower side of the tip part of the arm part **61**. Accordingly, each pressure acting part **33***b* of the lift plate **33** is guided by the inclined surface **65** and enters under the arm part **61** (see FIG. **11**) in the process of attaching the sheet feed cassette **3** into the apparatus body **2**. This arrangement also makes it possible to smoothly attach the sheet feed cassette **3** into the apparatus body **2**.

It is noted that while each support member **57** of the conveyance unit **5** of the present embodiment is formed integrally with each lever **55**, the present disclosure is not limited to such configuration. For instance, each support member **57** may be provided on the bottom surface of the apparatus body **2** or on the side surface of the guide part **40**. That is, each support member **57** is just required to be provided between the each lever member **55** and the apparatus body **2**. Still further, although each support member **57** is formed of the synthetic resin material, the material is not limited to be resin and the support member may be formed of an elastic member such as a spring and rubber.

Still further, although the pairs of front and rear levers **55** (the support member **57**), the eccentric cams **71** and others have been provided in the conveyance unit **5** of the present embodiment, the present disclosure is not limited to such configuration. For instance, the lever **55** (the support member **57**), the eccentric cam **71**, and others are just required to be provided at least at either one of the front and rear sides.

While the preferable embodiment and its modified example of the conveyance unit and the image forming apparatus of the present disclosure have been described above and various technically preferable configurations have been illustrated, a technical range of the disclosure is not to be restricted by the description and illustration of the embodiment. Further, the components in the embodiment of the disclosure may be suitably replaced with other components, or variously combined with the other components. The claims are not restricted by the description of the embodiment of the disclosure as mentioned above.

What is claimed is:

1. A conveyance unit comprising:

a cassette removably attached to an apparatus body;

a conveyance interlocked part provided in the apparatus body so as to be adjacent the cassette;

wherein the cassette includes;

a sheet storage part configured to store a sheet;

a lift plate liftably provided between a lowered position along a bottom plate of the sheet storage part and a raised position separated upward from the bottom plate; and

a biasing member configured to bias the lift plate to the raised position so as to cause the sheet on the lift plate to contact with a pickup roller;

wherein the conveyance interlocked part includes:

a lever configured to engage with the lift plate when the cassette is attached to the apparatus body and being liftable together with the lift plate;

a pressing mechanism configured to press the lever downward to keep the lift plate at the lowered position; and

a support member provided between the apparatus body and the lever so as to suppress a drop of the lever disengaged from the lift plate when the cassette is detached from the apparatus body,

wherein the pressing mechanism includes:

an eccentric cam fixed to an eccentric shaft; and

a driving unit configured to rotate the eccentric cam in one direction;

wherein the eccentric cam includes a lock part receded on a surface of the eccentric cam,

the lever includes:

a lever body rotatably attached to the apparatus body around a lever turning shaft;

an arm part configured to extend from the lever body toward the lift plate and coming into contact with an upper surface of the lift plate; and

a boss provided in the lever body so as to be relatively slidably along the surface;

the support member is formed to be elastically deformable in the lift direction of the lever,

the lever is disposed at a pressing position and holds the lift plate in the lowered position when the eccentric cam rotates and the boss is locked by the lock part, and

the lever is lowered from the pressing position within a range in which the support member is elastically deformable and is put into a state in which the lever can be lifted together with the lift plate by a bias force of the biasing member in a case when the eccentric cam rotates further from the state in which the boss is locked by the lock part and the boss is unlocked from the lock part.

2. The conveyance unit according to claim **1**, wherein the eccentric cam includes:

a first cam surface in slidable contact with the boss of the lever and having an eccentric radius that permits the lever to turn upward; and

a second cam surface formed continuously from the first cam surface, in slidable contact with the boss of the lever, and having an eccentric radius that presses the boss and turns the lever downward, and

wherein the first and second cam surfaces are continuously formed through the lock part on a side of the cam surface where the eccentric radius is large.

3. The conveyance unit according to claim **1**, wherein the driving unit includes:

a transmission mechanism including gears transmitting rotational drive of a driving source to the eccentric cam and

a restricting unit configured to restrict the rotation of the transmission mechanism.

4. The conveyance unit according to claim **3**, wherein the transmission mechanism includes:

an input gear rotationally driven by the driving unit;

a first gear having two tooth lacked parts and fixed to the eccentric shaft;

a second gear configured to be in contact with a side of the first gear, having two tooth lacked parts, and rotationally attached to the eccentric shaft; and

a compression spring connected between the first gear and the second gear,

wherein the second gear is provided to be engageable with the input gear,

the second gear is provided with a columnar part formed projectively on one end surface thereof,

the columnar part is provided with two receded parts on a circumferential surface thereof, and

the restricting unit includes a hook member engaged with or disengaged from either one of the two receded parts.

5. The conveyance unit according to claim **1**, wherein the arm part of the lever includes an inclined surface having a downward gradient from a tip side of the arm part toward a base end side at a lower side of a tip part of the arm part.

6. The conveyance unit according to claim **5**, wherein the support member includes a base part extending downward from a lower surface of the lever body and an extension part extending from a lower end of the base part so as to bend to the lift plate side and being formed into a shape of letter L.

7. The conveyance unit according to claim **6**, wherein the extension part declines toward the lift plate side from the base part side so as to be distant from the lower surface of the lever body.

8. An image forming apparatus comprising:

a conveyance unit configured to deliver a sheet toward a conveyance path;

wherein the conveyance unit includes;

a cassette removably attached to an apparatus body;

a conveyance interlocked part provided in the apparatus body so as to be adjacent the cassette;

wherein the cassette includes;

a sheet storage part configured to store the sheet;

a lift plate liftably provided between a lowered position along a bottom plate of the sheet storage part and a raised position separated upward from the bottom plate; and

a biasing member configured to bias the lift plate to the raised position so as to cause the sheet on the lift plate to contact with a pickup roller;

wherein the conveyance interlocked part includes:

a lever configured to engage with the lift plate when the cassette is attached to the apparatus body and being liftable together with the lift plate;

a pressing mechanism configured to press the lever downward to keep the lift plate at the lowered position; and

a support member provided between the apparatus body and the lever so as to suppress a drop of the lever disengaged from the lift plate when the cassette is detached from the apparatus body,

wherein the pressing mechanism includes:

an eccentric cam fixed to an eccentric shaft; and

a driving unit configured to rotate the eccentric cam in one direction;

wherein the eccentric cam includes a lock part receded on a surface of the eccentric cam,

the lever includes:

a lever body rotatably attached to the apparatus body around a lever turning shaft;

an arm part configured to extend from the lever body toward the lift plate and coming into contact with an upper surface of the lift plate; and

a boss provided in the lever body so as to be relatively slidably along the surface;

the support member is formed to be elastically deformable in the lift direction of the lever,

the lever is disposed at a pressing position and holds the lift plate in the lowered position when the eccentric cam rotates and the boss is locked by the lock part, and

the lever is lowered from the pressing position within a range in which the support member is elastically deformable and is put into a state in which the lever can be lifted together with the lift plate by a bias force of the biasing member in a case when the eccentric cam rotates further from the state in which the boss is locked by the lock part and the boss is unlocked from the lock part.

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